DOCUMENT RESUME

ED 475 930 IR 021 928

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TITLE	Online Professional Development: Building Administrators' Capacity for Technology Leadership.
PUB DATE	2002-06-00
NOTE	18p.; Funded in part by a grant from the Indiana Higher Education and Telecommunications System. In: NECC 2002: National Educational Computing Conference Proceedings (23rd, San Antonio, Texas, June 17-19, 2002); see IR 021 916.
AVAILABLE FROM	For full text: http://confreg.uoregon.edu/necc2002/ .
PUB TYPE	Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE	EDRS Price MF01/PC01 Plus Postage.
DESCRIPTORS	*Administrator Attitudes; *Administrators; *Computer Attitudes; Computer Uses in Education; Distance Education; Educational Administration; Educational Technology; *Online Systems; *Professional Development; *Technology Integration
IDENTIFIERS	Technology Implementation; Technology Policy; *Technology Role

ABSTRACT

The President's Committee of Advisors on Science and Technology (PCAST) (1997) suggested that in order to achieve effective use of computers in schools, a ratio of four to five students per computer was needed. Market Data Retrieval (Education Week, 2001) reported, in the year 2000, the student-computer ratio in U. S. schools dropped to an all-time low of 4.9 to 1, with 60% of the available computers now connected to the Internet. Given this increased access, expectations for both teacher and student use have increased as well. This research examined changes in administrators' ideas about technology integration and technology leadership while participating in an online professional development course. Eight administrators, enrolled in a semester-long course, participated in 16 discussion forums related to k-12 technology implementation issues. Pre- and post-course surveys indicated significant changes in ideas about technology integration as well as methods used to support teachers' integration efforts. Analyses of interview and course discussion data suggest that administrators view technology leadership as a "shared responsibility" that requires both administrative skills and technical knowledge. (Contains 21 references.) (Author/AEF)

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Online Professional Development:

Building Administrators'Capacity for Technology Leadership

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Key Words: technology leadership; technology integration; online professional development

Authors' Notes: This work was funded in part by a grant from the Indiana Higher Education and Telecommunications System. We gratefully acknowledge the time and effort donated by our participants as well as the assistance of Marilyn Glick and Sinem Senol during data collection and analysis.

IR021928

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Abstract

This research examined changes in administrators' ideas about technology integration and technology leadership while participating in an online professional development course. Eight administrators, enrolled in a semester-long course, participated in 16 discussion forums related to k-12 technology implementation issues. Pre- and post-course surveys indicated significant changes in ideas about technology integration as well as methods used to support teachers' integration efforts. Analyses of interview and course discussion data suggest that administrators view technology leadership as a "shared responsibility" that requires both administrative skills and technical knowledge.

Online professional development:

Building administrators' capacity for technology leadership

In 1997, the President's Committee of Advisors on Science and Technology (PCAST) suggested that in order to achieve effective use of computers in schools, a ratio of four to five students per computer was needed. Now, just a few years later, this ratio has been attained. According to recent reports from Market Data Retrieval (Education Week, 2001), in the year 2000, the student-computer ratio in U. S. schools dropped to an all-time low of 4.9 to 1, with 60% of the available computers now connected to the Internet. Given this increased access, expectations for both teacher and student use have increased as well. As Dickard noted (Education Week), "We have blasted ahead in computer penetration in the last few years. The real challenge now … is using the infrastructure to maximize impact" (p. 47).

In response to these changing expectations, efforts to provide professional development for teachers are increasing. According to Flynn (Education Week, 2001), "Across the board, the level of conversation around professional development is certainly more of a focus now than just talking about hardware and infrastructure" (p. 50). Latest figures from Market Data Retrieval (Education Week) support Flynn's contention, indicating that funding for professional development increased by 3% between 1999 and 2000 with approximately 17% of schools' technology budgets now being

spent on staff development. Although these figures still fall below recommended levels, nearly 90% of teachers surveyed by the National Center for Education Statistics (NCES, 2000) indicated that a variety of professional development activities were available and that they participated in them.

Yet, despite these increases in resources and training opportunities, teachers are still struggling to achieve high levels of integration (Becker, 2000; NCES, 2000). While it is necessary to provide teachers with access to technology and ongoing opportunities for professional development, these conditions appear insufficient to support the kinds of changes that integrated technology use seems to demand from teachers. Although Cuban (1993) claimed that the use of computers is incompatible with the traditional requirements of teaching, others have argued (Becker, 1994, 2000; Dexter, Anderson, & Becker, 1999) that if computers are placed within supportive school cultures teachers can, and will, maximize their potential. While a strong infrastructure will be necessary to *initiate* technology into the school culture, strong leaders will be necessary to *promote* and *sustain* it. Abundant access and ongoing training will not lead to effective use if teachers are not encouraged, or expected, to use computers in meaningful ways. Without a doubt, strong leadership is critical (Anderson & Dexter, 2000).

Few educators today would argue with the notion that the principal plays an important role in facilitating technology use in the schools. According to Crystal (2001), building administrators are the "nexus through which all issues flow" (p. 36). Yet many of our administrators are novice technology-users and have gained little experience or training in the knowledge and skills needed to be effective technology leaders. Even though administrators *understand* the importance of implementing and supporting technology use in their schools, the development of technology leadership skills seems to have been left almost completely to chance. According to Mehlinger and Powers (2002), "Graduate school programs generally are doing a poor job in preparing school principals and superintendents to be technology leaders" (p. 218). Since it is possible to obtain a principal's license without knowing anything about technology, how, then, are our administrators expected to develop these critical skills? What type of leadership role should they be prepared to take and what exactly do they need to know?

According to Schmeltzer (2001), administrators will need a broad set of experiences in order to be effective technology leaders. Above all else, these experiences should help them develop (1) an understanding of how technology can improve instructional practices, and (2) a repertoire of strategies for supporting teachers' efforts to use technology in the classroom. In short, they need both a *vision* and a *plan* to achieve it. According to Strudler and Wetzel (1999), these two characteristics are what *define* a technology leader: "At the core of informed leadership is a person who has internalized the complexity of effective technology integration [i.e., knows what it looks like] and who exercises influence [i.e., provides support] to ensure that the various enabling factors are in place" (p. 68, parenthetical comments added).

Sergiovanni (1999) outlined five potential roles that leaders assume within school settings including management engineer (focused on technical, organizational aspects), human engineer (focused on human relation supervision and conflict management aspects), clinical practitioner (focused on professional and pedagogical aspects), chief (focused on symbolic and visionary aspects), and high priest (focused on values, beliefs, and cultural aspects). Although Sergiovanni described the first three roles as essential to achieving *competent* schooling, the symbolic and cultural leadership roles were considered essential to achieving *excellence* in schooling. Because school culture governs group values, as well as norms, expectations, common meanings and shared assumptions, a cultural leadership role seems best suited to creating the type of environment, advocated by Becker (1994, 2000) and his colleagues (Dexter et al., 1999), as required for sustained technology use. As Duttweiler and Hord (1987) stated, "... in addition to being accomplished administrators who develop and implement sound policies, procedures, and practices, effective administrators are also leaders who shape the school's culture by creating and articulating a vision, winning support for it, and inspiring others to attain it" (p. 65).

Unfortunately, there is very little research delineating best practices for preparing administrators to be technology leaders. Until recently, professional development efforts have generally focused on the needs of the classroom teacher, with little attention paid to administrators' needs. Most school administrators have acquired their technology knowledge and skills on the job, with

occasional training provided by assorted vendors, professional organizations, and, to a lesser extent, colleges and universities (Mehlinger & Powers, 2002). However, initiatives by both private (e.g., Bill and Melinda Gates Foundation; California School Leadership Academy) and professional organizations (e.g., Institute for the Transfer of Technology in Education; National Association of Elementary School Principals Leadership Academy) have recently been designed to address leadership-training needs. Furthermore, a national collaborative has drafted a set of six technology standards for school administrators (TSSA, 2001) that can guide the redesign and/or development of new graduate courses and training experiences.

Colleges and schools of education have also started to consider ways to address the technology needs of administrators, most commonly by adding or modifying courses within their school administration programs (O'Neill, 1999). For example, Georgia State University recently redesigned its beginning leadership course, required for students in school administration, to simultaneously introduce students to technology issues and to the fundamentals of leadership (Mehlinger & Powers, 2002). An ongoing challenge with this approach, however, is maintaining a balance between leadership and technology issues. Given the number of issues that need to be addressed in both areas, innovative approaches will be needed if administrators are to gain the pedagogical, as well as the technical, knowledge and skills needed.

Purpose of the Study

This study was designed to examine changes in administrators' knowledge and skills, related to technology integration and leadership, as they participated in a semester-long online professional development course. By requiring administrators to *use* technology to *examine issues* of technology leadership, we hoped to support the development of administrators' ideas related to technology leadership, while simultaneously building their confidence and competence related to technology skills. Specifically, the questions guiding data collection and analysis included:

- What are administrators' ideas about technology leadership and how do these ideas change while participating in an online professional development course?
- What knowledge and skills do administrators need to affect technology leadership in

their schools and to what extent can participation in an online professional development course build both knowledge and skills?

Methods

Overview

We gathered both quantitative and qualitative data to examine changes in the knowledge and skills of eight administrators enrolled in a 3-credit course, *Integration and Management of Computers in Education*, during the fall semester of 2001. This course was one of two courses that participants were required to take during their first semester in the university's cohort doctoral program in school administration. Although cohort students had been required to take this course in the past, this was the first time the course was offered completely online. Furthermore, this was the first time the course enrolled only administrators; previous offerings of the course included a mix of administrators, undergraduate pre-service teachers, graduate in-service teachers, and graduate students in educational technology. Having a homogenous audience in the course allowed for a more extensive focus on technology leadership issues than had been possible previously.

Description of Course and Participants

All eight administrators agreed to participate in the study. Participants included two females; four participants were assistant principals, three were principals, and one was a district-wide instructional technology coordinator. Teaching experience ranged from 3 to 18 years, with an average of 7 years, while administrative experience ranged from 2 to 8 years, with an average of 4 years. At the beginning of the course, participants had varied levels of technology skills. Seven of the 8 administrators had completed at least one technology course during their previous degree programs, yet this was the first course any had taken that specifically dealt with technology integration or leadership issues. Most participants ($n = 6$) indicated that they used e-mail "as an integral part of their lives," yet only 3 indicated previous experiences with bulletin boards, while only 4 had used chat rooms previously. In general, participants described their uses of technology as being limited to "word processing and surfing the Web." None of the participants had previously taken an online course ("WebCT is completely new to me, as well as chat rooms and message

boards."). Participants expressed some initial uncertainty about learning via an online approach ("At this point, I am still uncomfortable using this type of technology to communicate.").

The 3-credit course was designed to help administrators gain both the competence and confidence needed to facilitate and support effective learning environments supported by technology. Participation in the course comprised a variety of virtual interactions and discussions and incorporated three primary strategies (modeling, reflecting, and collaborating) that, based on previous research, were judged to be effective in supporting teacher and school change. For example, participants observed (via the Web and CD-ROM) a number of model teachers, engaged in ongoing reflective conversations, and collaborated with each other for the completion of various course activities. As a cumulating activity, each participant created a WebQuest that they planned to implement with their building teachers during the spring, 2002.

Role of the Researchers

The research team consisted of a faculty member and seven graduate students enrolled in an advanced educational technology research course at a large midwestern university. Students had varied background experiences, in both corporate and postsecondary contexts, and were seeking masters (n = 2) or doctoral degrees (n = 5) in educational technology. The team worked collaboratively to design the study and develop data collection instruments. Each researcher then took primary responsibility for collecting and analyzing both discussion board and interview data from one participant. Group discussions, related to both quantitative and qualitative data analysis, allowed for pattern-finding and consensus building. Consistency of the research method was increased by agreement on recorded data collected by the research team. Multi-method strategies were used to increase the design validity by allowing triangulations at various stages of data analysis.

Data Collection and Analysis

Participants completed three online surveys at the beginning of the semester. These related to 1) previous experiences with technology applications, 2) specific ideas about technology integration, and 3) current technology practices within their schools. The first survey (15 questions) gathered

information about participants' current positions, previous uses of computers, and comfort with specific technology applications (e.g., chat rooms, discussion boards). The second survey (10 items) examined administrators' perceptions of how well they could conceptualize and define various components of technology integration. Survey items were presented in a Likert-style format; participants rated their level of agreement (from 1-strongly disagree to 5-strongly agree) with statements related to the possession of specific ideas regarding technology use (e.g., "I have specific ideas about how to define teacher/student roles in a technology integrated classroom."). The third survey, comprised of 44 items, examined the technology practices of both the administrators and teachers within the participants' school environments. Although this survey provided important information about the contexts in which our participants worked, not all items were relevant to our research questions (e.g., "Teachers' technology use is focused on student productivity." "Internet access is available in all classrooms."). However, 13 items, representing two subscales, were particularly relevant. One subscale (6 items) examined administrators' personal uses of technology (e.g., "I use technology to support lectures and/or professional development.") while the other subscale (7 items) asked the administrators to rate the extent to which they supported *teachers'* efforts to use technology (e.g., "I give individual feedback to teachers during technology use."). On a scale from 1 (entry) to 4 (proficient), administrators rated their current levels of practice. The second and third surveys were completed again at the end of the semester in order to measure changes in administrators' ideas about, and strategies for providing, technology leadership in their schools.

Cronbach's alpha was used to measure the internal consistency of the survey instruments. Calculated Cronbach alphas were .88 on the second survey (Ideas survey), and .77 and .70 on the two subscales of the third survey, respectively, suggesting that the instruments were moderately reliable.

In addition to survey data, all assignments (including the completed WebQuests) and discussion board postings (917 total messages) were used as data. Weekly discussions included, among other topics, administrators' reflections on their current visions for technology use in their

schools; roles they play in supporting high-, medium-, and low-level technology users; strategies for supporting teachers' early efforts; incentives and barriers to technology use, and so on. Weekly electronic chat sessions, focusing on issues of technology leadership, were also recorded for analysis purposes. During the 12th week of the semester, during a scheduled campus meeting for their other cohort course, all administrators participated in an in-depth interview that was tape-recorded and later transcribed. Questions built on earlier survey responses; we examined participants' current ideas about technology leadership and probed for any changes that may have occurred during the course (e.g., What does it mean to you to be a technology leader in your school? How have your ideas about technology leadership and technology integration changed since the beginning of the course?).

Data analysis began during the first week of the course and continued throughout the semester. Both quantitative (descriptive statistics and paired *t* tests) and qualitative (pattern seeking) analysis methods were used to determine the extent to which the online course offered a viable method for increasing administrators' understanding of, and capacity for, technology leadership.

Results and Discussion

Perceptions of Technology Leadership

Participants were asked to define technology leadership and to describe the skills and knowledge needed by a technology leader. In general, administrators defined technology leadership as the methods they, and others, use to encourage and support teachers' technology use. Similar to the description provided by Strudler and Wetzel (1999), participants indicated that strategies such as visioning, modeling, and coaching were key to being an effective leader. Although all 8 of the administrators believed that they, themselves, played the role of technology leader in their schools, most participants noted that they shared this role with others, either their technology-using teachers, the technology coordinator, or some other person in the school. As one elementary principal noted:

> I would not say I was the leader. I am more of a cheerleader. I view my role as a role model but also as a cheerleader who focuses teachers on what is the best. I have the opinion that I should not be the smartest person in the building, that it should be the teachers who are the

best resources. And that, thankfully, in my school, certainly is the case.

Carr (1995) refers to this style of leadership as participatory, suggesting that power and control are shared, at least to some degree, among constituents. This participatory style was commonly discussed, and agreed upon, by the administrators in this course. Although they believed that they, themselves, needed to initiate and support the technology integration efforts in their schools, they felt that others shared responsibility for seeing these efforts through: "I think it's ultimately my role ... but then we're all in this together. It's a building effort; it's something we all need to take responsibility for."

This perception of technology leadership as a shared responsibility may also reflect, to some extent, our participants' lack of technical expertise, as well as their relative unfamiliarity with classroom integration issues. This inexperience may have forced them to depend on others' technical knowledge as well as their teachers' classroom efforts to model a vision of meaningful use as well as inspire others to attain it. Still, all 8 administrators recognized the need to be strong role models:

> Technology leadership is defined by how well the instructional leaders of the building model the use of technology. I don't think I am going to be an effective leader if I am not using it myself. Now obviously there are some ways teachers are going to be able to use it differently than me, but I think as administrators we need to model.

Changes in Perceptions of Technology Leadership

Prior to taking this course, few of the participants had given much, if any, thought to their roles as technology leaders; technology leadership was not part of their daily conversations. For example, a high school assistant principal commented:

> I never even really knew that there was such a thing as technology leadership. And I guess I didn't know that it should come from the administrator. I thought, 'That's why they have a technology coordinator' but now I can see the importance of technology leadership...it's got to come from multiple sources.

By the end of the course, all of the administrators noted that they had gained ideas relevant to

being effective technology leaders; that is, they believed that they had increased both their understanding of technology integration as well as their knowledge of specific strategies needed to support teachers' efforts. "I feel that this class is leading more towards understanding how to integrate technology and how to facilitate that with staff." As one middle school principal inquired, "How can you lead by example if you don't understand the full potential of technology?" Another middle school principal described how his ideas had changed:

> When I entered the class I was unclear about the proper integration of technology. I would encourage teachers to use the Internet, drill and skill software, and word processing. Other than that, I did not have a good handle on the many possibilities. Since then I have really begun to better understand the use of technology in the classroom ... (I have also gained) the techniques and confidence to lead the staff as a technology leader in the building. It is something that I had not been very concerned about prior to this class.

Perceptions of Knowledge and Skills Needed by Technology Leaders

When asked what knowledge and skills they needed to be effective technology leaders, participants mentioned the need to be models for their teachers, but were unsure if they needed to know *more* than their teachers in order to be effective. For example, one principal explained:

> I don't know how to teach all the math and how to teach all the English and social studies. What I do know is how to work with those teachers to help them focus on areas that they're strong in. And I don't think I need to learn everything about technology to be an effective technology leader.

Similarly, another principal suggested that a good technology leader identifies the exemplary users in his school and then "gets out of their way." However, another principal disagreed, "Obviously, in order to have technology leadership in this building and in education, first, you have to model that." Another principal suggested that he "had to believe in it, had to use it, and had to model it." Certainly, the administrators agreed that they needed to have enough knowledge to hire the right people, to acquire the best resources, and most importantly, to know what good technology integration looked like so that they could encourage their teachers to continue to grow. In addition,

they agreed that they needed to know how to evaluate their teachers' technology efforts. Still, according to one assistant principal, "These skills are just good leadership skills, not necessarily technology knowledge skills. These are people skills, management skills."

Administrators agreed that an online course, focused on technology integration and technology leadership, filled an important need for practicing administrators. By requiring them to "live and breathe technology" they increased their own skill levels. As one elementary principal noted:

> The course design is inculpable... It has been unbelievable ... even to gain knowledge about technology, (I have) to use technology... and I am forced to communicate with my cohorts in this class through technology ... In this technology class, every single thing that I have done, every movement I have made in this class, has related to technology.

Given this increase in their own skills levels, the administrators also increased their expectations for their teachers. A high school assistant principal noted:

> The whole WebQuest concept has changed the way I talk to teachers about integrating technology into their classrooms... It's opened up ideas now that I can share with teachers in all subject areas ... it helps not only to think about uses of technology, but use of technology in various courses.

By developing a strong personal vision of technology integration, the administrators now believed that they could, in turn, support the development of their teachers' visions.

Developing the Skills and Knowledge of a Technology Leader via an Online Course

In order to determine the impact that this online professional development course had on the development of administrators' technology leadership knowledge and skills, pre- and post-course survey results were compared. A two-tailed paired t test ($df = 7$) indicated a significant increase in administrators' ratings of perceived ideas about technology integration (survey 2) from pre- to post-course ($t = 3.81, p = .007$). Average ratings increased from 3.7 (undecided-agree) to 4.0 (agree). This suggests that, as the course progressed, administrators gained ideas about what technology integration should look like, as well as how technology might be implemented within various classroom contexts (e.g., one-computer classroom; in support of content-learning). Given

that administrators play a key role in establishing a technology vision for their schools, as well as evaluating teachers' efforts toward achieving that vision, it is critical that they gain specific ideas about effective technology use. These ideas, then, represent an important component of being able to both lead and support teachers' efforts.

Although no significant differences were noted from pre- to post-course ($t = 1.19, p = .14$) on the first subscale of survey 3 (administrators' personal uses of technology), average ratings of competency on the second subscale (administrators' support of teachers' technology use) increased from 2.0 (emergent) to 2.4 (emergent-fluent). This increase was significant ($t = 2.82, p = .01$). Thus, as the administrators participated in weekly discussions, focused extensively on technology support issues, they were able to identify and implement new ways to support technology use among their teachers. As one principal noted:

> Taking this course has brought technology to the forefront for me … it's something that I discuss more with teachers ... I have started conversations with them about what they can do to help bring more technology into their classrooms. I ask them what are some of the things they need in order to accomplish the things they are thinking about. This course has helped me to go out of my comfort zone and to do a paradigm shift in my thinking on instructional practices in the classroom.

Ongoing discussions with the administrators suggest that this approach to professional development may be an effective way to increase confidence for, and ideas about, technology leadership. Administrators also agreed that the course increased their understanding of how to support technology use among their teachers, as noted by this assistant principal:

> (When I was a teacher) I did not have any training on how to effectively integrate technology in my classroom. Actually this is the first course that I have had that teaches how to integrate technology. Too bad I am not a teacher anymore. At least after having taken this class I will have an idea of how to assist someone in integrating technology.

Limitations and Directions for Future Work

Besides the small number of participants and the relatively short timeframe within which the

research was conducted, additional factors may limit the impact of this study. For example, because we did not have a control group, we are unable to determine the exact cause of changes in participants' ideas and support practices. Furthermore, although administrators described changes in their ideas about technology integration and leadership and reported that they developed specific ideas about how to support their teachers, it is unclear whether they will actually apply these ideas in practice. It would be useful to revisit these administrators after a year's time to determine the extent to which their ideas have been implemented and to identify other issues that may impact technology leadership as it is practiced in schools.

Educational Significance and Implications

The results of this study suggest that participation in an online course, focused on technology integration and leadership, offers one means to increase administrators' understanding of the complexity of the integration process and to advance their use of effective support strategies with their teachers. The participants noted that the course had increased their technology skills while also changing their ideas about how to support meaningful uses of technology in the classroom.

The administrators in this course described both benefits and challenges to taking a course that met entirely online. Specifically, participants valued both the synchronous (chat) and asynchronous (discussion board) interactions with their peers and agreed that the discussion of relevant issues, along with the completion of relevant assignments, were the most meaningful aspects of this course. Whereas this type of course format provided the flexibility needed to fit the course requirements into their already busy schedules and enabled them to avoid a lengthy drive to campus (from 1 - 3.5 hours, one-way), they still described limitations to this approach. Online communication can become overwhelming in terms of the amount of reading and writing that is required. Our participants, especially, found it difficult to complete group work and suggested that these types of requirements be limited or modified in such a way that individuals could complete separate pieces of a project, on their own, prior to combining them into a group project. In addition, trying to learn technology skills at a distance can be complicated and, perhaps, unnecessarily frustrating. Our participants all suggested that a few face-to-face, hands-on work sessions would have been useful

supplements to our online work. These are important considerations to keep in mind when preparing to offer this or similar courses in the future.

Conclusion

Schmeltzer (2001) noted that: "while bringing administrators up to speed on technology—and providing ongoing training—may seem like a massive task, designing a course that addresses technology in the context of leadership and management is a good place to start" (p. 22). Based on the results of this study, requiring administrators to deal with technology issues as part of their ongoing course participation allows them to experience, first-hand, both the benefits and challenges of dealing with technology in a meaningful and substantive way.

According to Mehlinger and Powers (2001), "It is no longer possible for administrators to be both naive about technology and be good school leaders" (p. 218). Yet, to date, the professional development needs of the administrator, as a technology leader, have been virtually ignored. Despite the large amount of time, money, and resources being directed toward supporting *teachers'* efforts to integrate technology in the classroom, little has been done to either recognize or support the needs of the administrator. "Clearly, it is not reasonable to imagine that teachers, the 'followers,' are going to get very far ahead of the 'leaders,' their administrators" (Mehlinger & Powers, p. 213). The results of this study highlights the importance of the administrator in helping schools achieve sound technology practices, and proposes one strategy (participation in an online course) for increasing administrators' capacity for technology leadership.

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